



IN REPLY REFER TO:

# United States Department of the Interior

FISH AND WILDLIFE SERVICE

FI-173

JUL 30 1997

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Sacramento Fish and Wildlife Office  
3310 El Camino Avenue, Suite 130  
Sacramento, California 95821-6340

July 28, 1997

Mr. Lester S. Snow  
Executive Director  
CALFED Bay-Delta Program  
1416 Ninth Street, Suite 1155  
Sacramento, California 95814

Subject: San Francisco Estuary Institutes's Category III Exotic Species Control  
Proposals

Dear Mr. Snow:

The Sacramento Fish and Wildlife Service Office supports the eight proposals submitted by the San Francisco Estuary Institute for exotic species research and control in the Sacramento-San Joaquin Bay-Delta estuary. These eight projects fit within the recommended actions in the Delta Native Fishes Recovery Plan and will help recover listed species in the estuary.

The Service recommends funding of these projects. Such projects are consistent with our mission of preserving fish and wildlife and recovering natural ecosystems and watersheds.

If you have any questions or concerns about the above, contact Robert Pine at (916) 979-2725.

Sincerely,

Wayne S. White  
Field Supervisor

CC: San Francisco Estuary Institute, Richmond, California

- a. Project Title:** The Role of Exotic Organisms in the Loss of Fish and Crayfish Species from the Estuary. DWR WAREHOUSE  
97 JUL 28 PM 2:59

**Applicant's Name:** The San Francisco Estuary Institute.

**Principal Investigator:** Dr. Andrew Cohen

- b. Project Description and Objectives.** The goal of this project is to assess the contribution of various stressors to the historic decline and elimination of four species of fish and shellfish from the San Francisco Estuary.

- c. Approach/Tasks/Schedule.** This project will research the circumstances surrounding the historic loss of four aquatic species from the Estuary—Sacramento perch (*Archoplites interruptus*), thicktail chub (*Gila crassicauda*), tidewater goby (*Eucyclogobius newberryi*) and sooty crayfish (*Pacifastacus nigrescens*). Research will focus on the former distributions, pattern and timing of decline, and relevant biology and life history of the four species, and the pattern and timing of action of possible stressors. This research will be conducted through review of published and unpublished literature and records, and personal interviews with agency personnel and other researchers.

After completing this research, we will assess the probable contribution of the different stressors to the declines based on (1) correlations between the spatial and temporal pattern of decline and the spatial and temporal pattern of the operation of the stressor; and (2) the existence of a plausible mechanism of action by the stressor that would lead to the decline.

A final report will be completed, and a journal article submitted based on the results of the study, within eleven months of the start of the project.

- d. Justification for Project Funding by CALFED.** The San Francisco Bay Estuary is recognized as the most invaded aquatic ecosystem in North America, with more than 200 introduced invertebrates, fish, plants, and microorganisms. Research conducted to date indicates that the introduction of nonindigenous species has caused significant negative impacts on fish and aquatic invertebrate species of the Bay-Delta ecosystem. The introduction of nonindigenous species has been identified as a critical factor affecting the health of the Bay/Delta Estuary by water agencies, environmental groups, the CCMP, BCDC, USFWS, CALFED and others. It is one of the seven non-flow factors targeted for research and management by Category III funding, and is one of the main stressors listed by the technical teams as appropriate for near-term funding and priorities.

Nonindigenous species may in general affect and have affected all of the priority habitats listed in this RFP. Native aquatic fauna of the Sacramento and San Joaquin River basins and the Delta that are currently in decline may be at risk of elimination due in part to negative interactions with introduced species. Negative interactions with exotics that have been suggested as impacting priority species include predation (salmon, Delta smelt), competition (splittail), hybridization (Delta smelt), interference with migration (salmon) and creating a contaminant pathway (sturgeon).

This project will contribute to our understanding of how particular stressors, or the interplay of various stressors, contributed to the decline and local extinction of native species from the Estuary, and thus will aid efforts to prevent or reverse declines in populations, including populations of some of the listed priority species. In addition, two of the species whose loss from the Estuary will be studied still survive in other waters, so that their restoration or return to their native habitat in the Estuary may yet be possible. This project will, by illuminating the role that different factors played in the elimination of these two species from the Bay and Delta, allow the development of a restoration plan with a greater likelihood of success.

- e. Budget Costs and Third Party Impacts.** The total cost of this project is \$18,917. No third party impacts are anticipated.

- f. Applicant Qualifications.** The San Francisco Estuary Institute (SFEI) is a non-profit research institute charged with fostering scientific understanding of the Estuary. The creation of SFEI responds to a recommendation of the Comprehensive Conservation and Management Plan (CCMP) for the San Francisco Estuary adopted by the Governor of California and the Administrator of the U.S. Environmental Protection Agency in late 1993. The Institute's 22 staffmembers provide an interdisciplinary team of scientists, education specialists, data analysts, and support personnel. The Institute also employs graduate students and undergraduate interns from area Universities. The Institute conducts or provides science support for four major programs: the San Francisco Estuary Regional Monitoring Program for Trace Substances, the Bay Area Wetlands Ecosystem Goals Project, the Bay Area Watershed Science Program, and the Biological Invasions Program.

SFEI's Biological Invasions Program researches issues of scientific and policy interest related to the introduction of nonindigenous species into marine and freshwater ecosystems. The research program is directed toward five objectives: (1) assisting efforts to prevent future invasions through scientific and policy research on vectors and the control of vectors; (2) developing an effective regional monitoring program to identify new invasions and track the spread of nonindigenous species that are present in the region; (3) understanding how factors in the environment affect the success of invasions; (4) assessing the impacts of invasions; and (5) developing, prioritizing and assessing methods to control nonindigenous species that are present in the region.

Principal Investigator: Dr. Andrew Cohen holds M. S. and Ph. D. degrees in Energy and Resources from the University of California at Berkeley. He is the author of the 1995 USFWS report on nonindigenous species in the San Francisco Estuary and of papers on other aspects of marine and aquatic invasions. Dr. Cohen has worked on and written about water system planning and economics, public health and contaminants in fish, and environmental mitigation; and has written articles and books for the general public on water and environmental policy and history. His work on invasions in the Estuary was profiled last year in the *New York Times* Science Page, and he was recently nominated to co-chair the Western Regional Panel on Aquatic Nuisance Species. He currently directs the San Francisco Estuary Institute's research program on biological invasions.

Intern: Gordon Becker holds a masters degree in Water Resources Management from the University of Wisconsin-Madison, where he also worked with the Water Resources Division of the U. S. Geological Survey. For the past three years he been a consultant on aquatic resources issues, including work on: a statistical analysis of the effects of temporary barriers on pumping station fish salvage in the Delta for the California Department of Fish and Game; an environmental review of the future water supply plan for the Contra Costa Water District; and population surveys and passage studies of steelhead in the Salinas River system for the Salinas River Basin Management Plan. Mr. Becker was a contributor to the 1997 Natural Resources Defense Council report "Hook, Line and Sinking" on the status of global fisheries. Under a 1983 Mellon Foundation Grant he conducted a study on the effects of coastal structures on erosion rates in southwestern Cape Cod, Massachusetts. He is presently completing coursework for certification as an Associate Fisheries Biologist by the American Fisheries Society.

- g. Monitoring and Data Evaluation.** The draft report will be circulated for external review to regional biologists and to any persons recommended by CALFED. Peer review will also occur when results are submitted for journal publication.
- h. Local Support/Coordination with other programs/Compatibility with CALFED objectives.** All priority habitats and species in the Ecosystem Restoration Program Plan are or could be affected by the types of stressors that will be assessed in this project, and thus stand to benefit from this project. In addition, the information developed through this study will be of direct value to any consideration of restoring two species of fish that have been lost from the Estuary.

The Role of Exotic Organisms in the Loss of Fish  
and Crayfish Species from the Estuary

Principal Investigator: Andrew N. Cohen  
San Francisco Estuary Institute  
1325 South 46th Street  
Richmond, CA 94804  
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fax: (510) 231-9414  
email: acohen@sfei.org

Organization Type: Nonprofit research institute  
503(c)(3) nonprofit organization

Tax identification number: 94-2951373

Contact person: Andrew N. Cohen

Participants/Collaborators: Gordon Becker

Project Group Type: Services

## Introduction: Biological Invasions in the Estuary

The San Francisco Bay Estuary is recognized as the most invaded aquatic ecosystem in North America, with more than 200 introduced invertebrates, fish, plants, and microorganisms. The introduction of nonindigenous species has been identified as a critical factor affecting the health of the Bay/Delta Estuary by water agencies, environmental groups, the CCMP, BCDC, USFWS, CALFED and others. It is one of the seven non-flow factors targeted for research and management by Category III funding, and is one of the main stressors listed by the technical teams as appropriate for near-term funding and priorities. Nonindigenous species may in general affect and have affected all of the priority habitats listed in this RFP. Researchers have also demonstrated or suggested that nonindigenous species have caused significant negative impacts on several priority species (salmon, trout, Delta smelt, sturgeon).

The San Francisco Estuary Institute has initiated a research program to address issues of scientific and policy interest related to the introduction of nonindigenous species into marine and freshwater ecosystems. The research program is directed toward five objectives: (1) assisting efforts to prevent future invasions through scientific and policy research on vectors and the control of vectors; (2) developing an effective regional monitoring program to identify new invasions and track the spread of nonindigenous species that are present in the region; (3) understanding how factors in the environment affect the success of invasions; (4) assessing the impacts of invasions; (5) developing, prioritizing and assessing methods to control nonindigenous species that are present in the region. Proposals in several of these areas are being submitted in the current funding cycle.

## Project Description and Approach

Interactions between native and nonindigenous species have been cited as possible or probable stressors leading to the decline and/or extirpation of several aquatic fishes and invertebrates in the Bay and Delta. This project will research the circumstances surrounding the historic loss of four aquatic species—Sacramento perch (*Archoplites interruptus*), thicktail chub (*Gila crassicauda*), tidewater goby (*Eucyclogobius newberryi*) and sooty crayfish (*Pacifastacus nigrescens*)—from the Estuary, in an effort to assess the probable contribution of suggested stressors in the elimination of these species. Interactions with nonindigenous species have been suggested as significant stressors contributing to the loss of these species. Other suggested stressors include habitat alteration, flow changes, parasitism and pollution.

The project will review evidence regarding hypotheses that particular stressors contributed significantly to the decline or elimination of these four species. Research into the conditions surrounding the loss of these species will be conducted through review of published and unpublished literature and records and through

personal interviews with agency personnel and other researchers. We will investigate whether temporal and geographic correlations exist between the action of a particular stressor and the decline of the species, and whether a plausible mechanism exists to explain the decline consistent with the species' biology and life history.

A draft report on the information obtained and the assessment of the evidence regarding the role of the various suggested stressors will be circulated to regional biologists for review. A final report will then be produced for submittal to CALFED. In addition, an article on the results of this study will be prepared for submittal to a scientific journal.

### **Location/Geographic Boundaries**

This research will focus on those areas where the four species being investigated were once present, but are now absent.

- The Sacramento perch was native to the lower Sacramento-San Joaquin drainage and the Delta, and the Pajaro and Salinas River systems, but is no longer found in these waters. It was last reported from the Delta in the 1950s, but survives in many reservoirs to which it was introduced in central and southern California and in other western states.
- The thicktail chub inhabited lowland streams, overflow ponds, marshes and lakes in the Sacramento-San Joaquin Valley. The last collection of a thicktail chub was in 1957, and it is now considered to be extinct.
- The tidewater goby inhabited brackish water coastal habitats of California but is no longer found in San Francisco Bay.
- The sooty crayfish inhabited streams tributary to the San Joaquin River and San Francisco Bay but has not been reported since the late 1800s, and is now considered extinct.

The information about causes of the decline of aquatic species that this project will develop may be relevant to other species found in other areas as well.

### **Expected Benefits**

#### **Stressors involved**

Stress factors that will be assessed include the following that have been suggested as causing or contributing to the loss of these species:

- for Sacramento perch—predation by exotic species (Shebley 1917; Aceituno and Vanicek 1976; P. Moyle, pers. comm.); competition with exotic species (Aceituno and Vanicek 1976; Moyle 1976; McGinnis 1984; Vanicek 1980); parasites (Goude and Vanicek 1985); habitat alteration (Aceituno and Nicola 1976); reproductive interference by exotic species (McGinnis 1984); reduction in available food (Aceituno and Nicola 1976); destruction of spawning grounds and nests by an exotic species (Smith 1896; Shebley 1917).

- for thicktail chub—habitat loss (Schultz and Simons 1973; B. Herbold, pers. comm.); competition with exotic species (Schultz and Simons 1973); predation by exotic species (P. Moyle, pers. comm.).
- for tidewater goby—habitat loss (Swenson and McCray 1996); predation by exotic species (Swenson and McCray 1996; Wang 1984; C. Swift, pers. comm.).
- for sooty crayfish—competition with exotic species (Riegel 1954; Bouchard 1977; Kimsey et al. 1982); "urbanization" (Bouchard 1977).

#### Priority habitat types involved

The following priority habitat types were significantly utilized by these species:

- Tidal perennial aquatic habitat (freshwater)—Sacramento perch, possibly thicktail chub, possibly sooty crayfish.
- Seasonal wetland and aquatic habitat—thicktail chub, possibly Sacramento perch, possibly sooty crayfish.
- Instream aquatic habitat—Sacramento perch, thicktail chub, sooty crayfish.
- Saline emergent wetlands habitat—tidewater goby.
- Midchannel islands and shoals habitat—possibly thicktail chub, possibly Sacramento perch, possibly sooty crayfish.

#### Benefits

This project will contribute to understanding how particular stressors, or the interplay of various stressors, contributed to the decline and local extinction of native species from the Estuary, and thus will aid efforts to prevent or reverse declines in populations, including populations of some of the listed priority species. For example, predation by and competition with exotic species have been suggested as important stressors on Delta smelt and on many species and populations of salmon and trout.

Two of the fish whose loss from the Estuary will be studied still survive in other waters (Sacramento perch and tidewater goby), so that their restoration or return to their native habitat in the Estuary may yet be possible. This project will, by illuminating the role that different factors played in the elimination of these two species from the Bay and Delta, allow the development of a restoration plan with a greater likelihood of success.

#### **Background and Biological/Technical Justification**

Research conducted to date indicates that the introduction of nonindigenous species has caused significant negative impacts on fish and aquatic invertebrate species of the Bay-Delta ecosystem. Native aquatic fauna of the Sacramento and San Joaquin River basins and the Delta that are currently in decline may be at risk of elimination due in part to negative interactions with introduced species. Negative interactions with exotics that have been suggested as impacting priority species include predation (salmon, Delta smelt), competition (splittail), hybridization (Delta smelt),

interference with migration (salmon) and creating a contaminant pathway (sturgeon).

Efforts to prevent future declines in native species or to reverse current declines can only be helped by a better understanding of what factors contributed to such declines in the past. Knowing which stressors have been important in the past can help to focus research and management efforts today.

As noted above, two of the native fish lost from the Estuary survive elsewhere and are thus potential candidates for restoration. A more thorough understanding of why these species were lost may be a prerequisite to successfully restoring them.

### **Proposed Scope of Work**

The proposed scope of work includes:

- Research—includes research into former distributions, pattern and timing of decline, and relevant biology and life history of the four species, and research into the pattern and timing of possible stressors; conducted through review of published and unpublished literature and records, and personal interviews with agency personnel and other researchers.
- Assessment—based on investigation of correlations between the pattern and timing of declines and of the operation of possible stressors, and of the plausibility of mechanisms of impact by possible stressors.
- Draft report.
- External review—as noted below under **Monitoring and Data Evaluation**.
- Final report and preparation of journal article.

The deliverables will be a final report to CALFED on the project and its findings; and an article submitted to a peer-reviewed journal.

### **Monitoring and Data Evaluation**

The draft report will be submitted to the contract manager and to appropriate regional biologists for external review and comment. In addition, persons recommended by CALFED will be asked to review the draft. The journal submission will also be subject to peer review.

### **Implementability**

There are no anticipated implementation issues. No permits are required for this project.



**Literature Cited**

- Aceituno, M. E. & S. J. Nicola. 1976. Distribution and status of the Sacramento perch, *Archoplites interruptus* (Girard), in California. *Calif. Fish and Game* 62(4):246-254.
- Aceituno, M. E. & C. D. Vanicek. 1976. Life history studies of the Sacramento perch, *Archoplites interruptus* (Girard), in California. *Calif. Fish and Game* 62(1):5-20.
- Bouchard, R. W. 1977. Distribution, systematic status and ecological notes on five poorly known species of crayfishes in western North America (Decapoda: Astacidae and Cambaridae). *Freshwater Crayfish* 3:409-423.
- Goude, C. C. and Vanicek, C. D. 1985. Parasites of the Sacramento perch, *Archoplites interruptus*. *Calif. Fish and Game* 71(1):246-250.
- Kimsey, J. B., Fisk, L. O and D. McGriff. 1982. *The Crayfish of California*. Inland Fisheries Informational Leaflet No. 1, Calif. Dept. of Fish and Game, Sacramento.
- McGinnis, S. M. 1984. *Freshwater Fishes of California*. U. C. Press, Berkeley.
- Moyle, P. B. 1976. Fish introductions in California: history and impact on native fishes. *Biological Conservation* 9:101-118.
- Riegel, J. A. 1954. A systematic and distributional study of the crayfish of California. M.S. thesis, University of California.
- Schulz, P. D. & D. D. Simons. 1973. Fish species diversity in a prehistoric central California Indian midden. *Calif. Fish and Game* 59(2):107-113.
- Shebley, W. H. 1917. History of the introduction of food and game fishes into the waters of California. *Calif. Fish and Game* 3(1):2-12.
- Smith, H. M. 1896. A review of the history and results of the attempts to acclimatize fish and other water animals in the Pacific states. *Bull. U. S. Fish Comm.* 15:379-475.
- Swenson, R. O. & A. T. McCray. 1996. Feeding ecology of the tidewater goby. *Trans. American Fisheries Society* 125:956-970.
- Swift, C. C., J. L. Nelson, C. Maslow and T. Stein. 1989. Biology and distribution of the tidewater goby, *Eucyclogobius newberryi* (Pisces: Gobiidae) of California. Natural History Museum of Los Angeles County. Contributions in Science, No. 404:1-19.
- Vanicek, C. D. 1980. Decline of the Lake Greenhaven Sacramento perch population. *Calif. Fish and Game* 66(3): 178-183.
- Wang, J. C. S. 1984. On the ecological status of the tidewater goby, *Eucyclogobius newberryi*, in a lagoon and lake of the Golden Gate National Recreation Area, CA. Final Report to the National Park Service #CPSU/UCD 337/1.

### Budget Table

Project Tasks	Direct Hours	Direct Salary and Benefits	Overhead	Other Direct Costs	Total Cost
Research					
Andrew Cohen	60	3,501	1,821		
Gordon Becker	200	2,900	1,508		
travel				180	
miscellaneous				200	10,110
Report Production					
Andrew Cohen	40	2,334	1,214		
Gordon Becker	100	1,450	754		
production costs				200	5,952
Article Preparation					
Andrew Cohen	20	1,167	607		
Gordon Becker	40	580	302		
publication costs				200	2,855
TOTAL		11,932	6,205	780	18,917

### Budget Justification

#### Research - Travel

800 miles @ \$0.30/mile = \$240

#### Research - Miscellaneous

Database search, books, reports estimated at \$200

### Schedule

#### Time to completion:

- |                               |                                |
|-------------------------------|--------------------------------|
| 1) Research                   | 3 months from start of project |
| 2) Prepare draft report       | 5 months "                     |
| 3) External review            | 7 months "                     |
| 4) Prepare final report       | 9 months "                     |
| 5) Prepare journal submission | 11 months "                    |

### Third Party Impacts

No third party impacts are anticipated.

## San Francisco Estuary Institute

The San Francisco Estuary Institute (SFEI) is a non-profit research institute charged with fostering scientific understanding of the Estuary. The creation of SFEI responds to a recommendation of the Comprehensive Conservation and Management Plan (CCMP) for the San Francisco Estuary adopted by the Governor of California and the Administrator of the U.S. Environmental Protection Agency in late 1993. The Institute's 22 staffmembers provide an interdisciplinary team of scientists, education specialists, data analysts, and support personnel. The Institute also employs graduate students and undergraduate interns from area Universities. The Institute conducts or provides science support for four major programs: the San Francisco Estuary Regional Monitoring Program for Trace Substances, the Bay Area Wetlands Ecosystem Goals Project, the Bay Area Watershed Science Program, and the Biological Invasions Program.

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Current projects of the program include:

- Developing methods for prioritizing efforts to control exotic marsh plants in the Estuary.
- Assessing the potential range and abundance of zebra mussels in California waters.
- Research on the introduction of organisms in the marine baitworm trade.
- Research on the invasion of the California coast by a Japanese foraminifer.
- Developing a regional monitoring plan for exotic organisms.
- Modelling the effect of invasion "incubators" on the success of obligate sexually-reproducing invaders.
- Review of open coast invasions, with a case study of the invasion of the Southern California Bight by a New Zealand sea slug.

Andrew N. Cohen  
Environmental Scientist  
San Francisco Estuary Institute

Dr. Cohen holds an M. S. and Ph. D. degrees in Energy and Resources from the University of California at Berkeley. He is the author of the 1995 USFWS report on nonindigenous species in the San Francisco Estuary and of papers on other aspects of marine and aquatic invasions. Dr. Cohen also worked on and written about water system planning and economics, public health and contaminants in fish, and environmental mitigation; and has written articles and books for the general public on water and environmental policy and history. His work on invasions in the Estuary was profiled last year in the *New York Times* Science Page, and he was recently nominated to co-chair the Western Regional Panel on Aquatic Nuisance Species. He currently directs the San Francisco Estuary Institute's research program on biological invasions.

#### Recent Publications

- Carlton, J. T. and A. N. Cohen. Episodic global dispersal in shallow water marine organisms: The case history of the European green crab *Carcinus maenas*, *J. Biogeogr.* (in press).
- Cohen, A. N. The exotic species threat to California's coastal resources, *Proc. California and the World Ocean '97 Conference*, March 24-27, 1997, San Diego CA (in press).
- Cohen, A. N. The invasion of the estuaries. *Proc. 2nd International Spartina Conf.*, Mar. 20-22, 1997, Olympia WA (in press).
- Carlton, J. T. and A. N. Cohen. Periwinkle's progress: The Atlantic snail *Littorina saxatilis* establishes a colony on Pacific shores, *Veliger* (in press).
- Cohen, A. N. and J. T. Carlton. Transoceanic transport mechanisms: The introduction of the Chinese mitten crab *Eriocheir sinensis* to California, *Pac. Sci.* 51(1): 1-11, 1997.
- Cohen, A. N. Biological invasions of the San Francisco Bay and Delta, *Proc. Nat'l Forum on Nonindigenous Species Invasions in U. S. Marine and Fresh Waters*, U. S. Capitol Building, Washington DC, Mar. 22, 1996.
- Cohen, A. N. and J. T. Carlton. *Nonindigenous Aquatic Species in a United States Estuary: A Case Study of the Biological Invasions of the San Francisco Bay and Delta*. U. S. Fish and Wildlife Service, Washington DC, Dec. 1995.
- Cohen, A. N., J. T. Carlton and M. C. Fountain. Introduction, dispersal and potential impacts of the green crab *Carcinus maenas* in San Francisco Bay, California, *Mar. Biol.* 122: 225-237, 1995.

#### Expert Testimony

- San Francisco Bay Regional Water Quality Control Board, Jan. 22 1997: Biological invasions.
- California State Water Resources Control Board, Oct. 5, 1994: Biological invasions.
- California State Water Resources Control Board, Nov. 13 & 16, 1991: Water system management.
- U. S. Senate, Committee on Energy and Natural Resources, Subcommittee on Water and Power, Mar. 18, 1991: Water system management.

Gordon Becker

Gordon Becker holds a masters degree in Water Resources Management from the University of Wisconsin-Madison, where he also worked with the Water Resources Division of the U. S. Geological Survey. For the past three years he been a consultant on aquatic resources issues. Recent representative projects include:

- Statistical analysis of the effects of temporary barriers on pumping station fish salvage in the Delta for the California Department of Fish and Game.
- Environmental review of the future water supply plan for the Contra Costa Water District.
- Population surveys and passage studies of steelhead in the Salinas River system for the Salinas River Basin Management Plan.

Mr. Becker was a contributor to the 1997 Natural Resources Defense Council report "Hook, Line and Sinking" on the status of global fisheries. He was co-author of a 1994 report, "Water Resources of the Bad River Reservation, Wisconsin." Under a Mellon Foundation Grant in 1983, he conducted a study commissioned by the Falmouth, Massachusetts Planning Department of the effects of coastal structures on erosion rates in southwestern Cape Cod. He is presently completing coursework for certification as an Associate Fisheries Biologist by the American Fisheries Society.

## NONDISCRIMINATION COMPLIANCE STATEMENT

COMPANY NAME

SAN FRANCISCO ESTUARY INSTITUTE

The company named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

## CERTIFICATION

*I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.*

OFFICIAL'S NAME

Margaret R. Johnston

DATE EXECUTED

July 25, 1997

EXECUTED IN THE COUNTY OF

Contra Costa County

PROSPECTIVE CONTRACTOR'S SIGNATURE

PROSPECTIVE CONTRACTOR'S TITLE

Executive Director

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

San Francisco Estuary Institute